AN APPROXIMATE THEORY FOR PREDICTION OF WAVE LOADS ON LAGRE TRUNCATED VERTICAL CYLINDERS

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ABSTRACT
Truncated vertical circular cylinders are one of the basic elements of many deep water floating offshore platforms such as Truss Spars and TLPs. When the draft of the cylindrical hull is relatively small, prediction of the surge and pitch diffraction loads by integration of McCamy and Fuchs expression of the force per unit length over the cylinder draft causes an error which is not negligible. Using hydrodynamic arguments the approximated surge and pitch loads by McCamy and Fuchs diffraction theory are modified. The modified results are compared with the results of a parametric study reported by Weggel (1994).

INTRODUCTION
Large truncated vertical circular cylinders are used as the hull of many deep water floating offshore platforms. When the cylinder is not sufficiently deep, no simple exact analytical expression exists for the calculation of surge and pitch loads. In this case numerical methods can be used. However, expensive software and expertise are required. An alternative approach is the use of the analytical and semi-analytical methods. For example one can refer to the works of Miles & Gilbert (1968) and Garrett (1971) who studied the diffraction problem of a circular dock. Black et al. (1971) calculated the loads acting on a truncated cylinder which is either floating or sitting on the seabed. Yeung (1981) derived a set of theoretical added masses and damping coefficients for a floating circular cylinder in water of finite depth. Bhatta & Rahman (1995, 2003) presented analytical and numerical results for the diffraction loads and radiation coefficients of floating circular cylinders in finite-depth water. An approximate but less elaborate method for prediction of loads acting on a truncated cylinder is the use of McCamy & Fuchs (1954) diffraction theory (Niedzwecki & Duggal 1992). In this article, we shall first study the accuracy of this method and then a more accurate approximation will be introduced.

APPROXIMATION OF SURGE AND PITCH LOADS
Let us consider a surface piercing bottom mounted circular cylinder and a surface piercing truncated circular cylinder as shown in Fig 1. The cylinder in Fig. 1a is divided into two parts *ABCD* and *CDEF*. The part *ABCD* is geometrically equivalent with the truncated cylinder in Fig. 1b.

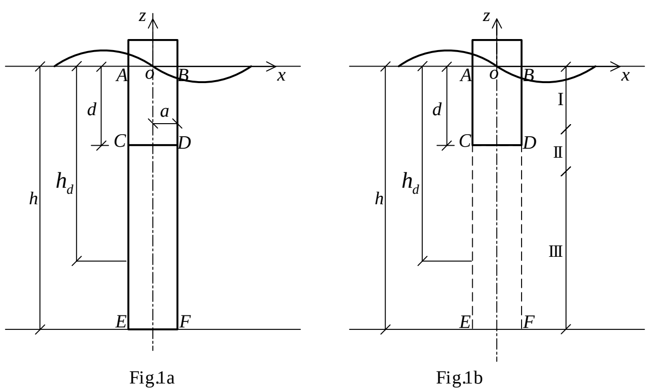

Figure 1- Surface piercing vertical circular cylinders. (a) Bottom-mounted (b) Truncated.